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OLIVE PRODUCTION and the

TABLE OLIVE INDUSTRY in SPAIN

by Karl W. Opitz

U. S. DEPARTMENT OF AGRICULTURE
Foreign Agricultural Service

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OLIVE PRODUCTION AND THE TABLE OLIVE INDUSTRY IN SPAIN

By Karl W. Opitz¹

SUMMARY

Spain's traditional leadership in world olive production remains unchallenged. Evidence indicates trends toward increasing output of Spanish green olives. Whether the high quality of the olives exported to favored markets can be maintained depends on rigorous enforcement of existing export regulations, olive prices both in Spain and abroad, and the requirements for foreign exchange. But an important factor affecting both amount and quality is the effectiveness of measures used in combating the *Dacus* fly and other insect pests.

Despite a constant upward trend in olive growing, the limit of land use for this crop may be eventually reached. Conditions tending to arrest further acreage expansion are:

1. Current governmental policy is aimed at developing balanced self-sufficiency in agricultural production.
2. Many influential farmers are anxious to raise other crops which net higher returns.
3. Five and a half million acres planted to one highly irregular-producing crop in such a small country is contrary to the concept of balanced agriculture.

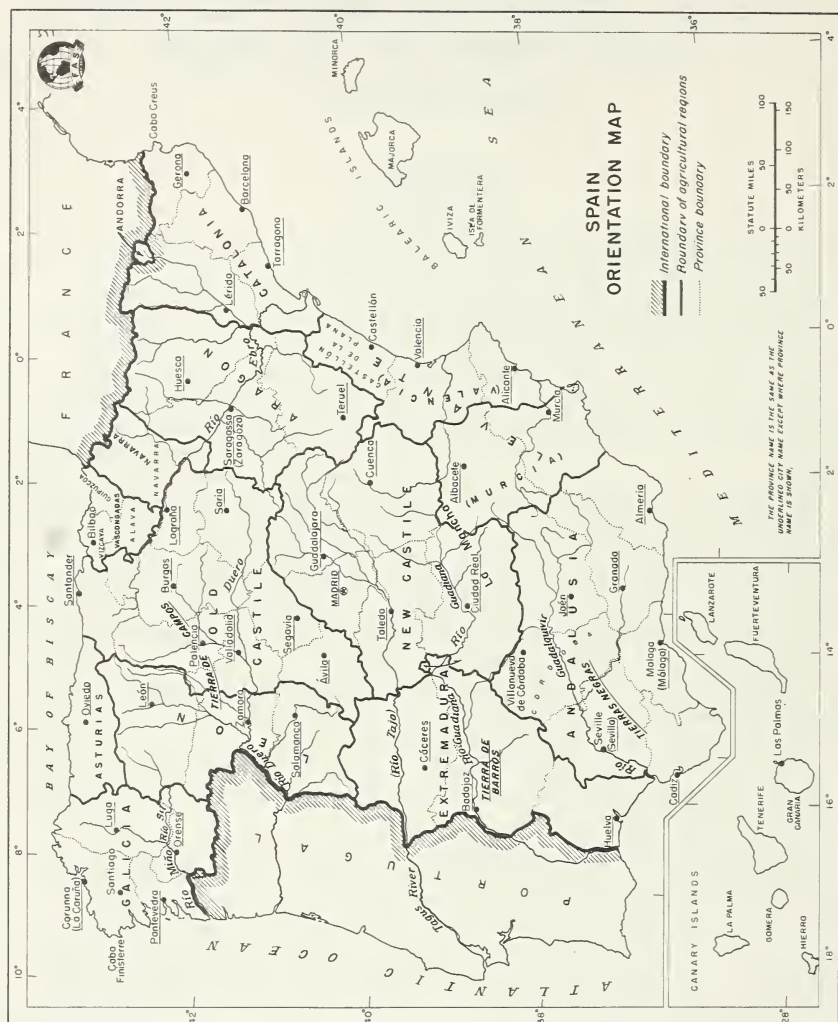
A grave deficiency in the means of developing and disseminating cultural information exists. However, steps are being taken to correct this.

Inadequate capital reserves and high priced loans prevent satisfactory farm development; excessive interest rates discourage many growers from obtaining needed maintenance and operation funds. On the other hand, table olive processors appear to be well financed. Fermented green olive production facilities are adequate to handle present trade requirements.

Needed consolidation of uneconomic farm units is prevented by the lack of industrialization in the country, with accompanying higher wage levels. The peasants retain marginal farms because they have few economic alternatives.

The Spanish Government regulates many phases of olive culture, processing, and marketing. These regulations are

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intended to stimulate maximum production and utilization of olives. At times, however, such activity results in stifling normal activities and causes resentment among the growers and processors.

PRODUCTIVE CAPACITY

Spain leads the world in olive acreage and in production of olive oil and table olives. In certain areas, as in parts of Jaen, Cordoba, and Seville Provinces, olives are planted so heavily that one may stand on a hill and see them in all directions. Olive production is the chief economic activity in several of the Provinces. As a matter of fact, Spain's economic health depends to a considerable extent upon satisfactory olive harvests. Although comparative values of olives during the period 1949 through 1952 ranged from but 4 to 11 percent of the total agricultural production, the export value of table olives and olive oil exceeded that of any other crop during this period.

Producing olive area currently amounts to roundly 5,100,000 acres. Area not yet producing is officially estimated at over 400,000 acres making the total number of acres utilized for olive growing over 5,500,000. In comparison, the area planted to olives in California is only 31,058 acres. This is only slightly more than one-half of 1 percent of the land used for olive growing in Spain.

In an interview, Don Antonio Berjillos del Rio, President of the Olive and Olive Oil Syndicate in Seville, stated that the Province of Seville cultivates 275,000 hectares (679,000 acres) of olive trees of which 40,000 hectares (98,800 acres) produce olives for pickling and exportation -- principally of the Queen and Manzanilla Fina types. Official figures for 1953 show that 70 percent of the table olives produced in Spain came from the Province of Seville. On the other hand, Seville had but 52 percent of the bearing table olive acreage.

Each year since 1900, with the sole exception of 1932, has seen an increase in the area used for olives. Olive production on the other hand has fluctuated greatly. Almost half the olive-producing Provinces have more than 60,000 acres each in olive trees, (table 1). The big 3 - Jaen, Seville, and Cordoba--account for 2,250,000 acres.

The 1953 olive oil production, which was about as large as the 1945-49 average, has been officially estimated at 363,800 short tons. Estimating that a ton of oil requires about 5 tons of olives, 1,819,000 tons of olives were crushed in this period. During the same time, table olive production officially amounted to 60,900 tons. Therefore, the total production of olives was 1,879,900 tons based on official figures. From these figures the calculated per acre yield from bearing olive trees averages but slightly more than a third of a ton. This

TABLE 1.--Bearing and nonbearing acreage in olive trees, in Spain, by Provinces, 1953

Province	Bearing	Nonbearing	Total
	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>
Albacete.....	56,915	6,533	63,448
Alicante.....	90,935	4,243	95,178
Badajoz.....	373,398	10,872	384,270
Baleares.....	52,138	754	52,892
Caceres.....	135,337	8,777	144,114
Cadiz.....	77,530	2,661	80,191
Castellon.....	145,147	3,113	148,260
Ciudad Real.....	278,531	61,763	340,294
Cordoba.....	643,011	6,840	649,851
Cuenca.....	79,756	19,677	99,433
Granada.....	149,938	3,763	153,701
Guadalajara.....	77,056	4,653	81,709
Huelva.....	74,476	1,063	75,539
Huesca.....	62,047	12,701	74,748
Jaen.....	862,587	41,906	904,493
Lerida.....	184,406	78,343	262,749
Malaga.....	215,101	46,764	261,865
Murcia.....	74,086	1,532	89,118
Seville.....	631,531	43,119	674,650
Tarragona.....	226,564	10,475	237,039
Teruel.....	81,815	6,585	88,400
Toledo.....	197,680	22,498	220,178
Valencia.....	94,323	14,475	108,798
Zaragoza.....	53,645	6,220	59,865
All others.....	181,621	18,360	199,981
Total.....	5,099,574	437,690	5,537,264

amount is so much lower than the apparent production that it must be assumed that over half the yield was unaccounted for. This could have been consumed directly by the producers and their hired help or by others who obtained olives or olive oil from the growers or mill operators without the production having been declared. Even if this brings the per acre yield to three-fourths of a ton, it remains very low by California standards.

Spain's olive acreage presently shows no signs of diminishing. On the contrary, considerable new planting is evident in that 7.9 percent of the area is nonbearing. No early slowing of olive production should be anticipated. As a matter of fact, growers desiring to remove olive trees must obtain permission from the government. Restrictions are so stringent concerning tree removal that it is common to hear complaints that some land now occupied by olives could be better utilized for other crops which bring higher cash returns. This sometimes leads to wilful neglect of olive trees to benefit the intercrop. It should be emphasized, however, that tree condition in general is good and they are usually well cared for.

Only two strains of Manzanillas and one of the Sevillana provide most of the olives used commercially for pickling. These varieties have proved successful and are the standard of excellence for the "green Spanish" olives.

The principal oil olive variety grown in Spain and particularly in the Jaen area is the Picual. Zorzalina is the major olive oil variety of Seville and Huelva. The Hojiblanca is most important in Cordoba and Malaga.

In 1953, there were 4,976,901 acres of bearing-age oil olive trees and 117,729 acres of bearing-age table olives. Table olives, therefore, represent but 2.25 percent of the total olive acreage.

UTILIZATION

A big increase in the volume of table olives available for export should be anticipated in the next few years. The primary reasons for this increase are:

1. Better returns for table olives as compared with oil olives. The government requires that the processors pay for table olives more than twice the minimum price paid for oil olives. Furthermore since World War II the table olive market has been good and many processors have paid comparatively high prices for them.

2. Increased returns for pickled olives have stimulated grafting of many thousands of oil varieties to table varieties in the Andalusian Provinces and lately in the Province of Badajoz. The area around Seville has seen much top working of the oil variety Zorzalina to the Gordal Sevillana particularly because of the premium prices paid for this "Queen" variety. According to Mr. Berjillos the principal reason for this is, "While olives intended for milling are sold at approximately 2 to 2-1/2 pesetas a kilogram, prices for Queens are about 10 pesetas a kilogram." He estimated the area in trees grafted to Queens in the last 10 years to be 5,000 hectares (12,350 acres) or 400,000 trees.

3. A recent joint order from the Ministries of Agriculture and Commerce permits curing additional varieties of olives in the "Sevillana" style. Standards governing the 1955-56 green olive crop have been modified so that more than double the number of varieties (12 in all) may be cured "Sevillana" fashion. Many Seville processors have roundly criticized this ruling. At the moment, however, it does not appear the new standards will be altered.

Spanish officials assert that the new rules in no way affect the high quality standards of olives designated for North American markets, England, Canada, and the United States are preferred customers and the controlling powers in the Spanish olive industry desire that only top quality fruit be consigned these countries.

More than 100 varieties of olive trees are cultivated in Spain. J. Miguel Ortega, Director of the Olive Research Station at Jaen lists 24 principal varieties in commercial production. Of these the Manzanilla de Dos Hermanos (Sevilla), the Manzanilla de Carmona, and the Gordal Sevillana are by far the most important pickling varieties. (table 2). When there is a short supply of "Manzanilla Finas" produced from the superior strains, then more than the usual

TABLE 2.--Production of green olives for pickling, by varieties and Provinces, 1954

Variety	Province					Total Spain
	Seville	Huelva	Bada'oz	Cordoba	Malaga	
	Short tons	Short tons	Short tons	Short tons	Short tons	Short tons
Queen ¹ (Gordal Sevillana).....	16,786	45	4	--	--	16,835
Manzanillas ²	21,940	1,061	--	--	--	23,001
Subtotal, "superior types".....	38,726	1,106	4	--	--	39,836
Manzanilla Serrana.....	--	47	--	--	--	47
Serranas ²	230	--	--	--	--	230
Rapazallas ²	1,494	70	--	--	--	1,564
Moron ³	1,091	--	--	--	--	1,091
Azofairon ²	97	--	--	--	--	97
Morada ⁴	119	--	--	--	--	119
Carrasquena.....	--	--	3,157	--	--	3,157
Unspecified.....	--	--	--	435	741	1,176
Total.....	41,757	1,223	3,161	435	741	47,317

¹ Normally the only kinds exportable to United States and Canada, the so-called superior types.

² A Manzanillo type fruit.

³ An inferior grade of Manzanillo used for local consumption.

⁴ Spanish "ripe" olives, consumed locally.

proportion of less desirable varieties is processed for the green olive trade. Thus in a poor harvest year Rapazallas, Carrasquenas, Serranas, and others find wider usage. Other Sevillana types may be likewise substituted for the esteemed "Gordal" when it is not plentiful.

The Seville region accounts for the bulk of exportable table olives. The area has been long noted for the quality of green fermented olives produced there. Some technical men acquainted with the situation think Spanish processors enjoy a special advantage due to larger amounts of sugars in their olives. Such naturally occurring carbohydrates are believed to encourage the fermentation process to proceed more rapidly and evenly to completion.

Briefly "Sevillana style" green olives are processed as follows:

1. Full-grown green to straw-yellow olives are carefully picked and transported to the plant as soon as possible.

2. The fresh fruits are sorted according to color and defects. Size grading may be done at that time or the olives may be handled "orchard run" and graded after pickling.

3. Next, they are placed in 1.5 to 2.0 percent soda-lye solution.

4. The lye is allowed to penetrate two-thirds to three-fourths the way to the pit.

5. As soon as sufficient penetration is evident, the lye solution is removed and the olives washed with water. Aeration and excessive washing is avoided to prevent undesirable color changes.

6. Next the fruit is quickly placed in large chestnut wood barrels and covered with salt brine the strength of which varies according to variety and may be increased daily until a concentration up to 8.0 percent is obtained.

7. After filling, the barrels are rolled to the fermentation yard or placed in large rooms where humidity and temperature are controlled to expedite rapid fermentation.

8. Barrels are kept full of brine and carefully checked to see that air is excluded and fermentation is proceeding satisfactorily.

9. After 1 to 4 weeks, supplementary sugar may be added when it is determined that adequate fermentable materials are lacking.

10. Fermentation may be completed in warm weather in 1 month. In cool weather 3 months or longer is required.

11. When completely fermented, the olives are stored in brine until finally regraded and packaged or barreled for shipment.

The best fermented green olives are exported. Inferior grades are either consumed in Spain or shipped to lesser markets. In 1953-54, for example, in addition to 38,812 tons of green olives suitable for export to North America, (table 3), 20,071 tons were produced which could only be consumed in Spain or exported to secondary markets.

"Moradas," or Spanish ripe olives, are processed and consumed locally. They are treated with lye, brined, and preserved in vinegar. Flavor is enhanced with garlic and spices. The color is usually a greenish purple.

TABLE 3.--Production of "export type" olives in Spain, average 1948-52, annual, 1945-54

Year	Queens	Manzanillas	Total
	Short tons	Short tons	Shorts tons
1945.....	13,227	16,534	29,761
1946.....	25,353	30,864	56,217
1947.....	28,699	24,251	52,910
1948.....	5,511	15,432	20,943
1949.....	34,171	26,455	60,626
1950.....	16,607	27,647	44,254
1951.....	35,731	25,443	61,174
1952.....	12,578	19,255	31,833
Average 1948-52.....	20,920	22,846	43,766
1953.....	20,983	17,829	38,812
1954.....	16,865	23,049	39,914

Recognizing the importance of North American and British markets, (table 4), the government through the Ministries of Agriculture and Commerce has designated the port of Seville as the only export point for table olives. This action is supported by two powerful organizations composed of growers and packers, the National Olive Syndicate and the Green Olive Board of Seville. Because of such policing, substandard fruit seldom reaches these favored markets. Notwithstanding this, owing to lack of control of the Dacus fly, U.S. food and drug inspectors are likely to continue to find cause for rejecting an appreciable amount of fruit in years of heavy fly infection.

Every legal shipment must have official approval. Contraband is dealt with harshly.

TABLE 4.--Exports of green pickled olives from Spain by country of destination, calendar years 1952-54

Country of destination	1954		1953		1952	
	Gallons	Percent	Gallons	Percent	Gallons	Percent
United States.....	11,281,232	82.45	11,835,152	82.80	12,990,896	86.58
Brazil.....	821,856	6.01	868,928	6.08	274,032	1.83
Canada.....	712,256	5.21	884,048	6.18	801,808	5.34
Cuba.....	229,600	1.68	223,824	1.57	317,040	2.11
Great Britain.....	153,616	1.12	78,416	.55	215,440	1.44
Mexico.....	95,600	.70	159,328	1.11	172,496	1.15
All others.....	387,552	2.83	243,872	1.71	232,032	1.55
Total.....	13,681,712	100.00	14,293,568	100.00	15,003,744	100.00

PRODUCTION MANAGEMENT

Most soils where olives are grown in Spain are calcareous and well drained. Except for nitrogen, they appear to be amply supplied with the required nutrients. Water, rather than fertilizer, is the chief limiting factor in tree growth and fruitfulness. Because Spain's olives grow almost entirely without irrigation, production is largely dependent upon annual rainfall, which varies from 8 inches at Almeria to 40 inches in Gerona.

In the olive growing regions of Catalonia, Aragon, and Valencia, elaborate systems of terracing are utilized to retain the thin soil and to conserve moisture. On the other hand, in Andalusia very little attention has been given to proper grove layout to prevent soil and moisture losses. Erosion steals an alarming portion of the best soil almost yearly. In some instances olive trees may be observed perched on ridges with the middles gouged 2 feet or more below the tree bases. Yet olive production reaches its peak in Andalusia possibly because of the deeper soils and more satisfactory varieties.

In parts of the great production centers around Jaen, Cordoba, and Seville, olives are planted on good soils. But, on the whole, thin hillside soils comprise most of Spain's olive land. In general, this is not a faulty arrangement because much of the interior bottom land is colder, and more suited to other crops. Olive trees grown on deeper soils of the inland valley floors are subject to damaging freezes. Of the cultivated tree fruits, only the Carob appears as well adapted to dryland hill culture. Nevertheless, much hill land planted to olives would be utilized best in forests or under controlled grazing.

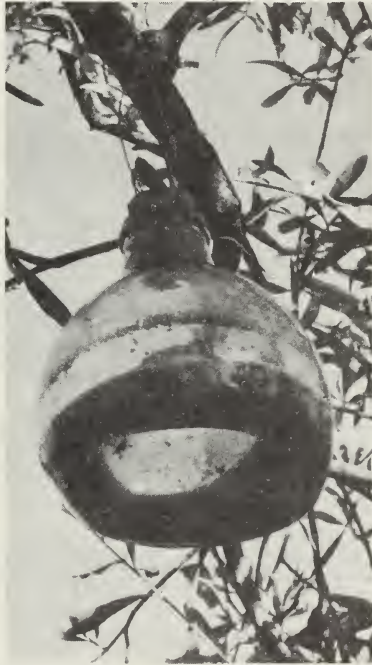
Olives are produced on both large and small farms. Accurate statistics are lacking on production by the different size classes. There are very large olive-producing farms, as in the Jaen, Cordoba, and Seville areas, but many farms in Spain comprise about 200 trees, or roughly 7 acres of olives. Olive farms are largely family operated. Over a large part of Spain olive culture combines with other farm operations



Oil olive trees in Tarragona Province, Spain, just before the harvest.



Olive farmer hand sprays his trees



Trap for olive fly (*Dacus oleae*), Spain's most destructive olive tree pest.

to provide hardly more than minimum subsistence living. Four thousand to five thousand trees are necessary for a good standard of living.

Olive trees under conditions of dry farming require many years (40 to 50) to attain full productivity. It often becomes necessary, therefore, to grow intercrops such as grapes and other fruits, grain, forage, almonds, or vegetables to assure an income from the limited farmland. This multiple-cropping system reduces olive yields and delays full production. Over 500,000 acres are intercropped or "unspecialized." This amounts to 13.5 percent of all olives grown.

Since most Spanish farmers live in villages a number of miles from their groves and go back and forth in wagons, on burros or bicycles, or afoot, they lose much time in travel. Whenever possible something is carried to and from the orchard, be it fertilizer, olive brush, or feed for animals gathered from the roadside or another uncultivated place.

The thrifty utilization of olive prunings illustrates Spain's meager supply of feed and fuel. Cattle, sheep, and goats browse the trimmings. Dried brush is used to fire limestone, tile, and charcoal kilns. Peasants use it in heating and cooking.

Grove boundaries are often irregular and do not promote efficient farming operations. Fortunately, there are few fences to prevent accessibility.

As previously indicated, climate largely determines the yield of a given olive variety. In years of ample rainfall and freedom from excessive heat or cold at blooming and fruit setting, the olive yields good to heavy crops. However, grave losses from insects frequently occur. Since this country is subject to drought and unpredictable, excessive downpours that cannot be stored for future use, per acre production averages are low.

The belief that irrigated olives do not pickle as well as those which are dry-farmed is widely held by most, if not all, Spanish growers and processors. Only 5.25 percent of the oil-olive acreage is irrigated (table 5), while just 4 percent of the table olives receive irrigation, (table 6). In Seville irrigated acreage is but a mere 2.5 percent of the total area in olives. Yet the annual rainfall here averages but 18.5 inches per year. Even where water is available for irrigation, it is seldom provided table olive varieties unless applied to an intercrop.

Pruning practices vary from one area to another. From the standpoint of maximum production this cutting is generally excessive. Owing to limited use of nitrogenous fertilizers and fungicidal spray and to the necessity for reducing transpiration during periods of drought, such severe pruning may be firmly based on observed results. This treatment seems to help check the olive knot disease. In addition, the Cycloconium

TABLE 5.--Bearing acreage of oil olives in Spain, irrigated and nonirrigated, specialized and unspecialized,¹ by Province, 1953

Province	Irrigated			Nonirrigated		
	Specialized	Unspecialized	Total	Specialized	Unspecialized	Total
	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>
Badajoz.....	--	--	--	290,775	74,444	365,219
Caceres.....	--	--	--	118,756	12,627	131,383
Cadiz.....	--	--	--	74,194	--	74,194
Ciudad Real....	124	49	173	172,476	102,299	274,775
Cordoba.....	941	--	941	629,183	9,600	638,783
Jaen.....	63,070	--	63,070	794,548	--	794,548
Malaga.....	3,217	314	3,531	190,371	6,580	196,951
Seville.....	494	1,537	2,031	552,071	11,374	563,445
All others.....	130,064	61,029	191,093	1,280,776	395,988	1,676,764
Total.....	197,910	62,929	260,839	4,103,150	612,912	4,716,062

¹ Specialized--only crop grown; unspecialized--intercropped.

TABLE 6.--Bearing acreage of table olives in Spain, irrigated and nonirrigated, specialized and unspecialized¹, by Province, 1953

Province	Irrigated			Nonirrigated		
	Specialized	Unspecialized	Total	Specialized	Unspecialized	Total
	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>
Badajoz.....	--	--	--	3,978	4,201	8,179
Caceres.....	--	--	--	3,509	445	3,954
Cadiz.....	--	--	--	3,336	--	3,336
Ciudad Real....	--	--	--	2,842	741	3,583
Cordoba.....	--	--	--	3,212	74	3,286
Jaen.....	148	--	148	4,821	--	4,821
Malaga.....	44	7	51	14,104	462	14,566
Seville.....	865	618	1,483	59,395	235	59,630
All others.....	2,114	771	2,885	9,568	2,239	11,807
Total.....	3,171	1,396	4,567	104,765	8,397	113,162

¹ Specialized--only crop grown; unspecialized--intercropped.

and *Macrophoma* fungi, which find the most suitable environment in dense trees, are usually minor problems. Fruit sizes are said to be improved by such heavy pruning.

Fertilizer requirements are usually met by occasional applications of barnyard manure and composts. When olive income is adequate, many operators apply ammonium sulfate or another nitrogenous fertilizer in late winter or early spring. Superphosphate may also be applied with the nitrogen concentrate.

Control of the olive fly (*Dacus oleae*), "Mosca del Olivo," is by far the most important problem facing Spanish olive growers. So great is the importance of the olive industry to Spain's economy, the problem of controlling this pest takes precedence over other immediate agricultural problems. Inadequate control of the olive fly cost Spain over half its olive crop this past season. Fifty to sixty percent of olives harvested for pickling had to be rejected. Processors were required to carefully grade and regrade pickled fruit to eliminate fly-damaged olives. Olive oil production suffered from drastically reduced yields and lowered quality.

Needless to say, present olive fly control measures used by farmers are inadequate. Some experimental work conducted by Spain's Ministry of Agriculture this past season indicates the possibility of control by repeated hand applications of well-timed bait sprays. A grave problem remains in getting the work done properly. Spanish olive growers suffer from lack of adequate working capital. Furthermore, they do not quickly change work methods. Fly infestations vary from year to year. In years when winters are severe and the atmospheric humidity is low the *Dacus* fly is not a serious problem. Because the biologic activity of the fly is largely dependent upon weather and climate, it is impossible to establish calendar spray schedules. Exact knowledge derived from many field stations is essential to successful spray operations.

Another fly that attacks olive trees is the bark fly (*Clinodiplosis oleisuga*), "Mosquito de la corteza." Unlike *Dacus oleae*, its ravages are confined to the tree and it causes injury similar to the work of the bark beetles (*Phloeotribus scarabaeoides*, *Hylesinus oleiperda*, and *Hylesinus frasinii*), all known as "Barrenillo." Damage results from burrowing in the bark and outer wood.

The olive kernel borer (*Prays oleae*), "Polilla del Olivo," and olive thrips (*Liothrips oleae*), "Aranuelo del Olivo," are important pests in certain districts from time to time. Yet the damage caused by these insects is usually secondary compared with the destruction wrought by the olive fly. The olive scale (*Parlatoria oleae*) which requires drastic control measures in California is of minor importance in Spanish olive production. Oddly enough the same olive scale attacks many deciduous fruit crops (apples, pears, peaches, plums) with considerable destructiveness.

In the more humid areas olive growers are frequently troubled with a disease termed "Negrilla del Olivar." It is also known as "mangla" (gum), "tizne" (smut), "carbori" (coal), and "melaza" (molasses). The trouble is of secondary origin. It develops as a black smutty covering over leaves, stems, and fruit from the exudations of sucking insects -- primarily from black scale (*Saissetia oleae*), "Cochinilla del Olivo." Destruction of the scale controls "Negrilla." Other scale insects attacking olive trees are ivy scale (*Aspidotus hederae*), "Piojo blanco," white louse, and elm scale (*Mytilococcus ulmi*), "Serpeta del Olivar."

Two kinds of hoppers damage olive shoots, leaves, and flowers: the little barrel hopper (*Hysteropterum grylloides*), "Barrillo," and the cotton hopper (*Euphyllura olivina*), "Algodon."

Spanish agricultural authorities deem the use of parathion too hazardous and have prohibited its application. Experimental work with parathion has been abandoned for the present.

Except in parts of the Seville, Jaen, and Cordoba areas, spraying with heavy power equipment is impractical because of the rough terrain, irregularly spaced trees, high costs in relation to returns, or the presence of intercrops. For these reasons the use of portable low-pressure equipment appears most practical.

Farm labor is usually available for harvesting and cultural operations as needed. However, to avoid additional expense, many farmers try to do the work with their own families. Thus, when timing is important the labor force may be inadequate to the task. Keeping wormy fruit from becoming sources of flies that infest healthy olives is a tremendous job, especially where oil olives are allowed to remain on the tree or ground until late in the season. Undetected, dropped fruit containing fly larvae or pupae become sources of infestation the following year.

Consolidation of small, uneconomic parcels of olive land may improve farm management problems. On the other hand, to remove the peasant from his farm, however meager it may be, could result in more unemployment. Certainly, the plight of the landless peasant is worse than the poor farmer who barely wrests a living from his inadequate plot of ground. At present, farm wages in Spain are among the lowest in Europe. Most farm laborers work about 150 to 250 days annually and receive the equivalent of \$1 or less per day or a yearly income between \$150 and \$250.

Cultivation of Spanish olive groves follows the pattern established centuries ago. Crude plows drawn by asses, mules, horses, or oxen are used to till the soil--usually four times a year. In small plots this work may even be done by hand with heavy hoes. The belief is still widely held that plowing benefits the soil by aerating it. This activity, along with light harrowing and hand hoeing, keeps the weed growth down and thus removes this source of competition for water and nutrients. Unfortunately, such tillage opens the ground to the ravages of heavy rains and accentuates erosion. It also destroys some shallow roots whose function may benefit the crop during the period of flowering and fruit setting.

A handy device to catch oil olives pulled or beaten off the trees is widely used. It consists of a sheet of strong cloth suspended between two ladders hinged at the apexes. The olives are picked or beaten off the tree and onto the sheet.

Harvesting table olives is almost exclusively from straight ladders. The olives are picked into baskets and carefully transported on the backs of animals, in wagons, motor trucks, or flat cars to the processing plant.

RESEARCH IN OLIVE CULTURE

Spanish olive leaders and Ministry of Agriculture officials recognize the importance of scientific investigation in solving problems relating to olive culture. Much good work has been accomplished and more is underway. In relation to the importance of the olive industry and magnitude of its problems, however, funds and technically trained personnel needed are inadequate. Field investigations suffer from lack of workers who combine theoretical knowledge with practical training.

At present there is no effective agency for getting cultural information to most growers. Newspapers, trade journals, and Ministry of Agriculture and Provincial publications find little, if any, circulation among the peasantry. The latter publications generally lack reader appeal and are usually incomprehensible to most farmers. An extension service is being organized to meet these needs. It may eventually provide the best means of developing and disseminating practical field information.

PROCESSING FACILITIES

Since the raw material for the green olive industry thrives in greatest abundance in the Province of Seville, it is natural that the vast majority of the processing plants be located here. The biggest concentration of them is at Dos Hermanos. Almost all of the green olive plants in Spain are located within 20 miles of the city of Seville. Adequate physical facilities and plentiful cheap labor are at hand. Proximity to the Port of Seville provides nearly ideal conditions for easy, inexpensive movement into the world markets. As pointed out, climatic conditions favor green olive pickling.

Many plants own their water systems and auxiliary power units to insure continued function. Waste disposal apparently presents no problem.

Plant expansion to meet increased demands is solved by either installation of additional facilities or erection of new buildings whenever and wherever needed. Because of the lack of suburban development adjacent to cities and towns the movement of olive factories into the fringe areas is not as difficult as it might seem in such a densely populated country as Spain.

Basic layout of green olive plants does not vary greatly. All have large walled-in fermentation yards. Minor differences occur in the number and types of mechanical size graders, holding tanks, and caustic and brine storage facilities. Differences in spatial allotment for sorting, pitting, stuffing, storage, barreling, bottling, and labeling vary from plant to plant. Some olive factories are modern, clean,



Modern olive processing plant at Dos Hermanos, just outside of Seville.



Sorting olives by hand. In processing, much work is hand-done and pay is low.



Processed, green, "Sevillana" style, pickling olives shown before pitting.



Graded, green olives are hand washed at plant near Seville.



These hand-pitting machines have an average output of 15 olives per minute.



Green olives are sample-graded at plants by women workers.



Green olives of the "Sevillana" type are carefully graded for the export market.

spacious, and bright. Others are ancient, dirty, crowded, and poorly illuminated.

Since labor is cheap, few mechanical aids to convey olives from one place to another are employed as compared with California green olive plants. No mechanical pitting machines are found in Spain. Hand pitting devices are simply constructed and easily operated and maintained. The output is approximately 15 olives per minute.

Capital requirements for plant operation and expansion are apparently met by local banking institutions. Established processors appear well financed. Some are so strong financially that they need not borrow operating funds.

Under the present government, labor has practically no voice in management. No bona fide organization represents the employees. There is considerable discontent, especially because of low wages. Current wages for women olive workers amount to about 40 cents a day, men \$1 or less. Nevertheless, overt acts against employers are seldom reported.

A social security system has been recently established. At the present time, it is inadequate to meet the needs of the beneficiaries, I was told. Employers complain that it represents a severe tax on them without achieving its purposes. Employees say that they do not receive enough to pay for medication when sick or for living expenses when out of work.

GOVERNMENT AND THE OLIVE INDUSTRY

Government policies and programs are aimed at maintaining and encouraging maximum production and utilization of the best green olives for foreign trade. Exportation of these table olives provides Spain with more dollar exchange than does any other item. It should be emphasized that the government is keenly aware of the need for maintaining high export standards lest lucrative markets be lost to competitor countries. At the Port of Seville a new laboratory is being equipped to facilitate the testing of olives destined for foreign markets. Authority to maintain high export standards and to issue loading permits is entrusted to one highly competent individual. He has been given almost absolute powers to prevent shipment of substandard fruit.

It has been pointed out that the government's ruling requiring processors to pay a premium for table olives over the price of oil olives has stimulated greater supplies of green fruit.

Although inclusion of less esteemed fruit in the new regulations governing the types of olives to be pickled "Sevillana" style may appear to be a step away from high standards, the apparent intent was to stimulate the pickling of more fruit that could be used to supply less-demanding markets. Perhaps

another reason for this move was to encourage maximum production of green olives to provide adequate supplies in short-crop years. Olive men here recognized that in order to properly supply their markets they must have plenty of olives on hand at all times. This means it is necessary to have reserves to assure sufficient "pickles" when harvests are poor.

No restrictions are placed on new olive plantings other than requiring growers to follow good practices in using desirable varieties in approved districts. In an interview with the Director General of Agriculture it was emphasized that henceforth farmers will be required to plant on the contour to forestall soil erosion and water losses.

A complex relationship exists between the National Olive Syndicate, the Ministries of Agriculture and Commerce, and individual growers. Criticism is heard that growers often have difficulties in obtaining import licenses for supplies and equipment, owing to the government's desire to husband foreign exchange. Widespread experimentation with new foreign insecticides and mechanical farm equipment has not been undertaken because of inability to obtain the required import permits. Occasionally, too, there is lack of complete coordination among the above agencies on research and entomological and other field work.

The National Olive Syndicate functions in some respects similarly to certain Pest Control Districts or Inspection Associations in California. It is a quasi-governmental body whose job consists of advising, directing, or carrying out needed pest control or fruit quality or volume regulation work. It also advises the Ministry of Agriculture on measures necessary to foster and protect the olive industry.

Since the government controls exchange rates this function may result in a subsidy or penalty on shipments of olives according to the rate set. The Government has varied the exchange rate for pickled olives. Exports from the 1953 crop, for instance, were classed in Export Exchange Group I by the Spanish Government, and therefore yielded only 23.6 pesetas for each dollar earned (a combined rate, only 10 percent of the proceeds being eligible for the official free rate of 38.95 pesetas per dollar, and 90 percent at the official rate of 21.90 pesetas per dollar). In June 1954, following claims by olive shippers that increased wages had made the export business unprofitable, the government placed table olives in Group II. This category is more generous to the exporter and entitles him to 27 pesetas per dollar earned by olive exports (30 percent at the 38.95 rate and 70 percent at the 21.90 rate).

Although this is a more favorable rate than is in effect for some commodities (the rate may be as low as 21.90 per dollar), it is not the most favorable, for the government permits exporters of some items as much as 37 pesetas per dollar. The rate of 27 pesetas per dollar has been in effect for the 1955-56 olive season.

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